

REMARKS/ARGUMENTS

Favorable reconsideration of this application, in view of the above amendments and following remarks, is respectfully requested.

Claims 1-7 and 9-16 are pending in this application. By this amendment, the specification is amended; Claims 1 and 11 are amended; no claims are added; and Claim 8 is canceled herewith. Support for the amendment to Claim 1 can be found at least in original Claim 8, for example. Support for the amendment to Claim 11 can be found at least in the specification on pages 13-14, para. [0032], for example. It is respectfully submitted that no new matter is added by this amendment.

In the outstanding Office Action, the Abstract was objected to; Claims 1-5 were rejected under 35 U.S.C. § 103(a) as unpatentable over WO 03/105544 (U.S. Patent No. 7,469,654) to Ishibashi in view of U.S. Publication No. 2002/0066536 to Hongoh; Claims 6-9 and 16 were rejected under 35 U.S.C. § 103(a) as unpatentable over Ishibashi in view of Hongoh and U.S. Patent No. 6,091,045 to Mabuchi; Claim 10 was rejected under 35 U.S.C. § 103(a) as unpatentable over Ishibashi in view of Hongoh and U.S. Publication No. 2004/0002221 to O'Donnell; Claims 11-13 were rejected under 35 U.S.C. § 103(a) as unpatentable over Hongoh; Claim 1 was provisionally rejected on the ground of nonstatutory obviousness-type double patenting as unpatentable over Claim 8 of copending U.S. Application No. 10/570,631 to Nozawa in view of Hongoh; Claim 1 was provisionally rejected on the ground of nonstatutory obviousness-type double patenting as unpatentable over Claims 1, 2, and 4 of copending U.S. Application No. 11/632,779 to Tian in view of Hongoh; Claim 1 was provisionally rejected on the ground of nonstatutory obviousness-type double patenting as unpatentable over Claims 1, 2, and 4 of copending U.S. Application No. 11/691,154 to Sasaki in view of Hongoh; and Claim 1 was rejected on the ground of

nonstatutory obviousness-type double patenting as unpatentable over Claims 1, 2, and 4 of U.S. Patent No. 6,953,908 to Ishii in view of Hongoh.

With respect to the objection to the Abstract, the Abstract is replaced by the present amendment. Withdrawal of the objection to the Abstract is respectfully requested.

With regard to both the provisional rejections and the non-provisional rejection¹ of Claim 1 on the ground of nonstatutory obviousness-type double patenting, those rejections are respectfully traversed. In particular, Claim 1 is amended to include the features previously recited in Claim 8, which features, as explained below, are not taught, suggested, or rendered obvious by the claims in any of Nozawa, Tian, Sasaki, or Ishii, in view of Hongoh. Accordingly, in view of the amendments to Claim 1 and the lack of teachings in the applied art, withdrawal of the provisional and non-provisional double-patenting rejections is respectfully requested.

With respect to the rejections of Claims 1-10 and 16 under 35 U.S.C. § 103(a) based on Ishibashi in view of Hongoh and one of Mabuchi and O'Donnell, those rejections are respectfully traversed. Applicants respectfully submit that the applied art does not teach, suggest, or render obvious all of the features recited in independent Claim 1. In particular, amended Claim 1 recites, in part:

wherein said transmissive window has, in a center area thereof, a hanging portion made of a same material as a material of said transmissive window, and a **gap** with a predetermined distance or more is formed **between an outer peripheral surface of the hanging portion and a sidewall of said support part**, and

wherein L/D is equal to 3 or more, where L is a vertical length of the hanging portion and D is the predetermined distance

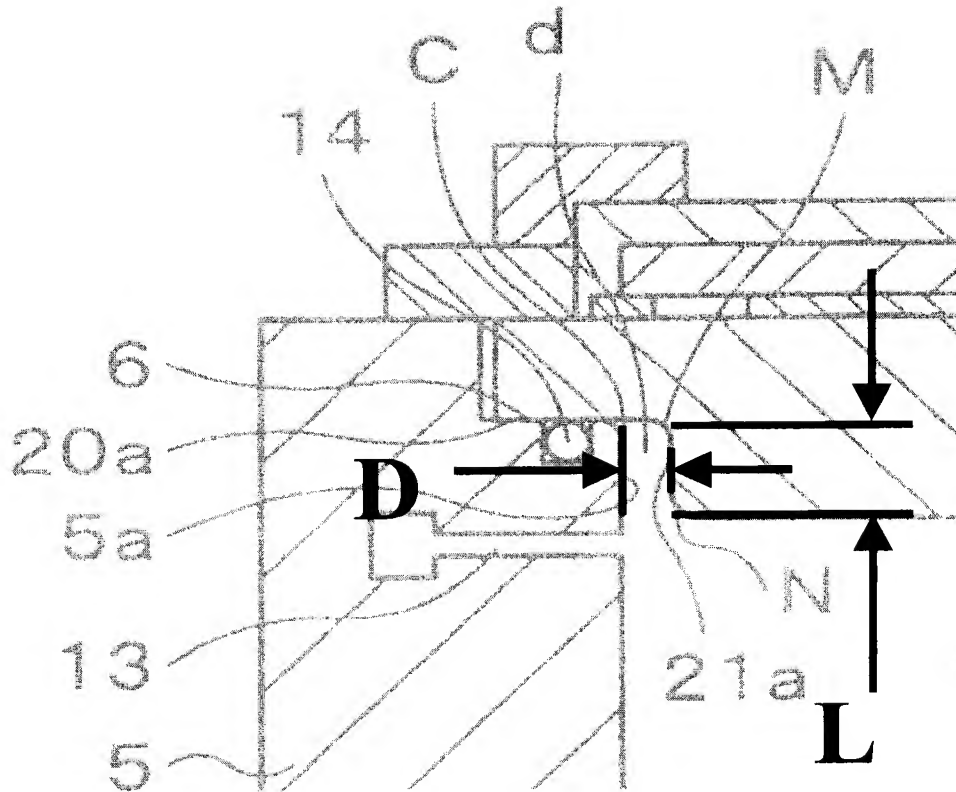
Thus, Claim 1 recites a plasma processing apparatus including a transmissive window. The transmissive window has, in a center area thereof, a hanging portion made of

¹ Although the Office Action states that the double-patenting rejection based on Ishii in view of Hongoh is provisional, Applicants respectfully submit that as Ishii is an issued patent, the double patenting rejection based thereon is not provisional.

the same material as a material of the transmissive window. A gap with a predetermined distance or more is formed between an outer peripheral surface of the hanging portion and a sidewall inner surface of the support part. Further, where L is a vertical length of the hanging portion and D is the predetermined distance, the relationship L/D is equal to 3 or more.

In the instant application, since a strong impedance change point occurs on the outer peripheral surface of the hanging portion due to the existence of the hanging portion having a gap between itself and the sidewall inner surface of the process vessel, the microwave propagating outward from the inside of the transmissive window reflects thereon. As such, electric field concentration on a contact point between the support part and the transmissive window is alleviated. Consequently, an edge effect occurring near the contact point is reduced, which can prevent an adverse effect that a member near the contact point is sputtered due to the edge effect and contamination occurs. See the specification at page 3, para. [0007].

Further, since the ratio between the vertical length L of the hanging portion and the distance D of the gap (L/D), is equal to 3 or more, the outer peripheral surface of the hanging portion functions as a shielding wall to prevent the contact point between the support part and the transmissive window from coming into sight of the substrate. See Fig. 3 reproduced in part, herein below with emphasis added showing the distance D and the length L . As a result, particles and radicals, which are sputtered by a strong electric field, and plasma near the peripheral edge portion of the support part on the inner side of the process vessel are blocked by the shielding wall, so that an amount of these radicals reaching the substrate is reduced. See the specification at page 3, para. [0007] and page 21, para. [0050]. Thus, in the instant application, the edge effect is reduced by providing the hanging portion and an amount of the sputtered particles, radicals, etc. that reach the substrate is reduced.



Specification, portion of Fig. 3 (emphasis added)

Applicants appreciate the Office Action acknowledging on page 4 that Ishibashi does not teach or suggest how to determine the predetermined distance of the gap between the inner sidewall and the hanging portion of the top plate support. Thus, it follows that Ishibashi also does not teach or suggest that L/D is equal to 3 or more, where L is a vertical length of the hanging portion and D is the predetermined distance, as recited in amended Claim 1. The Office Action asserts on page 7, however, that the combination of Hongoh and Mabuchi cure the above-mentioned deficiency of Ishibashi. Applicants respectfully disagree.

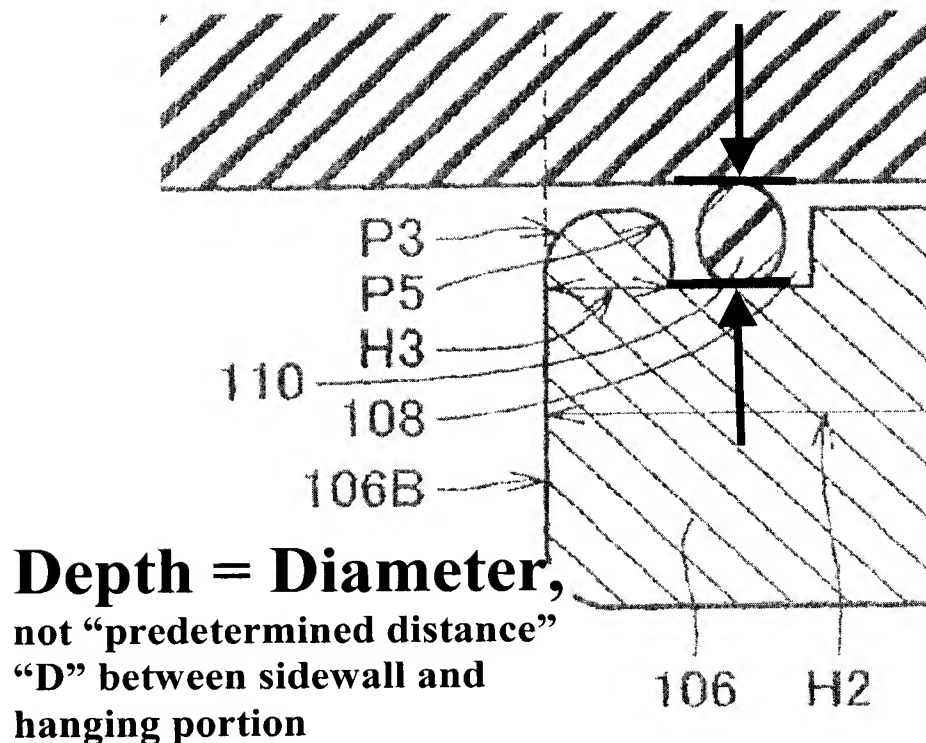
In particular, the Office Action asserts that paragraph [0035] of Hongoh “teach[es] that predetermined distance D can be selected as per process limitations like material of the transmissive plate, and can be e.g. 3-6 mm.” Applicants respectfully disagree. Instead, Applicants submit that paragraph [0035] of Hongoh refers to Fig. 2, discussing the radius of curvature of the corner (P5) and indicating that the *depth* of the sealing groove (108) is based

on the *diameter of the O-ring sealing member* (110). See Hongoh, paras. [0034]-[0035], and the portion of Hongoh, Fig. 2, reproduced herein below. Hongoh, para. [0035] states:

The radius of curvature of corner portion P5, which depends on the depth of sealing groove 108, is approximately 1 mm. Here, sealing groove 108 is approximately from 3 to 6 mm in depth and **sealing member 110 held within groove 108 is approximately from 3 to 6 mm in diameter.**

Note that the depth of the sealing groove (108) is the same diameter of the sealing member (110). Also note in Fig. 2, that, while the O-ring depicted is not a perfect circle, there is still an undescribed gap between the lateral sides of the O-ring and the supporting shelf (106), which implies that the distance is greater than the depth.

Further, even in Fig. 3 of Hongoh, which shows an insulating plate (80) having a portion that hangs into the chamber, it is clear that there is **no reference arrow or numeral directed to the gap** between the hanging portion and the sidewall of the corner (P6) on the supporting shelf (122). As such, Hongoh is silent regarding the width of the gap.



Hongoh, portion of Fig. 2 (emphasis added)

Thus, in Hongoh, the depth of the sealing groove (108) is a distance between a lower surface of the insulating plate (80) and an upper surface of the supporting shelf (106) and is, therefore, a completely different dimension than the predetermined distance D recited in Claim 1. Therefore, Hongoh does not teach or suggest setting a predetermined distance D between an outer peripheral surface of the hanging portion and a sidewall of the support part. As such, like Ishibashi, it follows that Hongoh also cannot teach or suggest the relationship L/D is 3 or more, as recited in amended Claim 1.

With respect to Mabuchi, even assuming that Hongoh disclosed a distance “D” between the outer peripheral surface of the hanging portion and the sidewall of the support part, *which it does not*, Mabuchi does not teach or suggest a length “L,” with which a relationship could be determined with respect to the distance “D,” as recited in amended Claim 1. Specifically, the “depth H_{A1} ” in Mabuchi is a depth of an inner *recess* (14a) formed in a microwave window (14) and **is not** the depth (or vertical length) of the hanging portion at a gap at the outer periphery of the transmissive window next to the edge section (21a) of the counter electrode (21). Mabuchi, col. 6, lines 9-12. Thus, the “depth H_{A1} ” is a dimension of a portion of the window (14) that is different from the length “L” recited in Claim 1. There is no suggestion that the depth of the inner recess would be the same as a hanging portion at the outer periphery.

Further, one of ordinary skill in the art would have no apparent reason to combine Mabuchi with Hongoh and Ishibashi because Mabuchi specifically **teaches away** from having a gap between a hanging portion of the window and the support wall. Fig. 10 of Mabuchi shows a protruding portion of the window (14) abutted **directly against** the edge section (21a) and states “the annular protrusion 14b also serves to protect the edge section 21a of the counter electrode 21 against plasma.” Mabuchi, col. 6, lines 12-14; and Figs. 9, 10, and 15, for example. Thus, Mabuchi teaches away from having a gap with a distance “D”

between the outer peripheral surface of the hanging portion and the sidewall of the support part, and does not teach a vertical length “L,” which could be related to the distance “D,” as recited in amended Claim 1.

Additionally, Applicants respectfully submit that O'Donnell does not teach or suggest that a gap with a predetermined distance or more is formed between an outer peripheral surface of the hanging portion and a sidewall of said support part, wherein L/D is equal to 3 or more, and where L is a vertical length of the hanging portion and D is the predetermined distance, as recited in Claim 1. Accordingly, no reasonable combination of Ishibashi in view of Hongoh and one of Mabuchi and O'Donnell would include all of the features recited in Claim 1 or any of the claims depending therefrom.² Therefore, withdrawal of the rejections of Claims 1-10 and 16 under 35 U.S.C. § 103(a) based on Ishibashi in view of Hongoh and one of Mabuchi and O'Donnell, is respectfully requested.

With respect to the rejection of Claims 11-13 under 35 U.S.C. § 103(a) based on Hongoh, that rejection is respectfully traversed. In particular, Claim 11 recites, in part, that under the support part, an eave portion projecting into the process vessel is **disposed apart from a contact point between the support part and said transmissive window by a predetermined distance** or more.

Thus, the eave portion is different from the support portion and functions as a shielding wall and assists in reducing an amount of particles, radicals, etc. which are sputtered by a strong electric field and plasma near a peripheral edge portion of the support

² With respect to dependent Claims 2 and 3, Applicants respectfully submit that since a gap of 0.5 to 10 mm or 0.5 to 5 mm is formed between the outer peripheral surface of the hanging portion and the sidewall inner surface of the process vessel, a sheath of the microwave plasma of about 0.2 mm length is formed both on the outer peripheral surface of the hanging portion and the sidewall inner surface. Consequently, the plasma enters the gap, and for example, by this plasma neutralizing charge-up near the contact point, it is possible to form the generation of a strong electric field near the contact point. Furthermore, as a result of the reduced edge effect, the loss of power of the microwave due to the edge effect decreases, and as a result, plasma density of the whole plasma processing apparatus improves. This improves plasma density at the center portion of the processing apparatus to enhance uniformity of, for example, an oxide film forming rate in the substrate surface, which enables more uniform processing. See the specification, paras. [0008]-[0011] and [0053]. Thus, in addition to patentably distinguishing over the applied art for the reasons discussed with respect to Claim 1, Claims 2 and 3 also distinguish over the applied art.

part on the inner side of the process vessel and reach the substrate. See the specification, para. [0019], for example.

The Office Action asserts on pages 9-10 that Fig. 2 of Hongoh shows a “lower stepped portion on which the sealing ring 110 rests” is distanced from a lower surface of the insulating plate (80) by a predetermined distance. However, as is explicitly described in paragraph [0034] of Hongoh, the “lower stepped portion on which the sealing ring 110 rests” is a supporting shelf 106/supporting plane 106A supporting the insulating plate 80 via the sealing ring 110. That is, the “lower stepped portion on which the sealing ring 110 rests” corresponds to the support part recited in Claim 11, and thus cannot also be an “eave portion,” as recited in Claim 11. Further, the insulating plate (80) in Hongoh only contacts the O-ring sealing member (110) and does not *contact* the support portion at all. See Hongoh, Figs. 2 and 3. Thus, Hongoh does not teach or suggest a contact point between the support part and said transmissive window and cannot therefore teach an eave that is disposed apart from such contact point. Accordingly, Hongoh does not teach, suggest, or render obvious all of the features recited in amended Claim 11. Withdrawal of the rejection of Claims 11-13 under 35 U.S.C. § 103(a) based on Hongoh is respectfully requested.³

Consequently, for the reasons discussed in detail above, no further issues are believed to be outstanding in the present application, and the present application is believed to be in condition for formal allowance. Therefore, a Notice of Allowance is earnestly solicited.

³ With respect to dependent Claims 12 and 13, since the eave portion is formed so as to be apart from the contact point between the lower surface of the transmissive window and the support part by 0.5 to 10 mm or 0.5 to 5 m, a sheath of the microwave plasma of about 0.2 mm length is formed both on the outer peripheral surface of the hanging portion and the sidewall inner surface, as recited in Claims 2, 3. Consequently, the plasma enters the gap, and for example, by this plasma neutralizing charge-up near the contact point, it is possible to form the generation of a strong electric field near the contact point.

Should the Examiner deem that any further action is necessary to place this application in even better form for allowance, the Examiner is encouraged to contact the undersigned representative at the below-listed telephone number.

Respectfully submitted,

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